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New distributional records of *Megachile* Latreille, 1802 (Apoidea: Megachilidae) from Indian States

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Abstract

Based on the recent survey materials and backlog collections deposited in the Hymenoptera section, Zoological Survey of India, Kolkata, seven *Megachile* species, four belonging to subgenus *Eutricharaea* and one species each of *Aethomegachile*, *Callomegachile*, *Creightonella* and *Pseudomegachile,* are reported for the first time from different states of India. Floral association and distributional data of studied species are also provided.

Keywords: Hymenoptera, India, Leafcutter Bees, Mason Bees, Pollinator, Resin Bees

Introduction

Megachile Latreille, 1802 (Hymenoptera: Apoidea: Megachilidae) is one of the hyper diverse bee genera that includes leafcutter, resin and mason bees. At present, about 1500 species under 70 subgenera are described worldwide (Michener, 2007; Ascher & Pickering, 2020), whereas, more than 150 species of *Megachile* belonging to a dozen subgenera are recognized as valid from Southeast Asia (Ascher & Pickering, 2020), among which, around 120 species have been documented from India (Gupta, 1993; Veereshkumar, 2015; Ascher & Pickering, 2020). *Megachile* species are solitary and many are highly seasonal, co-related to the bloom of their preferred host plants (Ascher, *et al.*, 2016). In south-east Asia, megachilid bees are poorly documented and under-represented in collections and their distribution pattern is seldom explored (Engel & Gonzalez, 2011; Gonzalez & Engel, 2012). The present study attempts to update the distribution status of eight *Megachile* species from India and shed light on their association with different plants, acquired by reviewing literature.

Material and Methods

Extensive surveys were conducted from different parts of India for collection of *Megachile* bees and specimens were also sorted out from unidentified backlog collections at the Hymenoptera Section, National Zoological Collection (NZC), Zoological Survey of India, Kolkata, West Bengal, India. The specimens were collected using sweep net and Yellow Pan Trap (YPT) methods. Collected specimens were observed in detail and studied under a Nikon SMZ25 stereozoom microscope. Microphotographs were obtained using a Nikon DS-Ri2 camera attached to the microscope and processed by the NIS-Elements BR Analysis 5.20.00 software. Vouchered specimens were deposited with appropriate registration number at NZC, Zoological Survey of India, Kolkata.

Results and Discussion

Taxonomy

Family MEGACHILIDAE
Subfamily MEGACHILINAE
Tribe **Megachilini**
Genus ***Megachile*** Latreille, 1802

I. Subgenus ***Aethomegachile*** Engel & Baker, 2006

1. *Megachile (Aethomegachile) laticeps* Smith, 1853 (Figure 1a)

1853. *Megachile laticeps* Smith, *Cat. Hym. Brit. Mus.*, **1**: 183 (H, ♂).

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Material examined: 01 ♀, India, West Bengal, Darjeeling, Rangpo, 27.1595°N 88.5088°E, 14.ix.1978, sweep net, coll. A.N.T. Joseph; 01 ♀, Andhra Pradesh, Coringa Wildlife Sanctuary, Hope Island, 16.9234°N, 82.2739°E, 13.xii.2018, Sweep net, coll. A. Rameshkumar; 01 ♀, Rajasthan, Kota, 28.iv.1993, sweep net, coll. Sharma.

Distribution: India: Lakshadweep, Maharashtra, Kerala, Tamil Nadu (GBIF, 2020d), West Bengal (new record), Andhra Pradesh (new record), Rajasthan (new record).

Floral associations: *Crotalaria pallida, Peltophorum pterocarpum* (Fabaceae), *Memecylon caeruleum* (Melastomataceae), *Vitex trifolia* (Lamiaceae) (Ascher, *et al.*, 2016), *Dendrolobium umbellatum* (Fabaceae) (Soh *et al.,* 2018), *Cajanus cajan, Crotalaria juncea, Lablab purpureus* (Fabaceae), *Ocimum basilicum* (Lamiaceae) (Amala *et al.,* 2019).

II. Subgenus ***Callomegachile*** Michener, 1962

2. *Megachile (Callomegachile) disjuncta* Fabricius, 1781 (Figure 1b)

1781. *Apis disjuncta* Fabricius, *Ape. Insect* I, p. 481.

Material examined: 01 ♂, India, West Bengal, Calcutta (= Kolkata), Botanical Garden, 09.viii.1966, coll. K.K. Roy; 01 ♂, Hooghly, Chandannagar, 09.xi.1965, coll. K.K. Roy; 01 ♀, Odisha, Ganjam, Badakuda Island, Chilika lake, 22.vii.1916, coll. F.H. Gravely.

Distribution: India: Rajasthan, Himachal Pradesh (Bingham, 1897), Chandigarh, Haryana (Kumari & Kumar, 2018), Gujarat (Gupta, 1993), Uttarakhand, Maharashtra, Tamil Nadu, Kerala (GBIF, 2020a), Jammu & Kashmir (Shankar *et al.*, 2017), West Bengal (new record), Odisha (new record).

Floral associations: *Derris pinnata, Vitex negundo* (Lamiaceae), *Duranta* sp., (Verbenaceae) *Cajanus cajan, Crotalaria juncea* (Fabaceae), *Jacaranda mimosifolia* (Bignoniaceae) (Gupta, 1993), *Peltophorum pterocarpum* (Fabaceae) (Soh and Ascher, 2014), *Vitex trifolia, Premna foetida* (Lamiaceae), *Tamarindus indica, Crotalaria pallida* (Fabaceae), *Memecylon caeruleum* (Melastomataceae), *Syzygium zeylanicum* (Myrtaceae), *Antigonon leptopus* (Polygonaceae), *Asystasia gangetica* (Acanthaceae), *Averrhoa carambola* (Oxalidaceae) (Ascher *et al.*, 2016), *Dipterocarpus obtusifolius* (Dipterocarpaceae) (Engel and Gonzalez, 2011), *Parkinsonia aculeata* (Fabaceae) (Shankar *et al.*, 2017).

III. Subgenus ***Creightonella*** Cockerell, 1908

3. *Megachile (Creightonella) fraterna* Smith, 1853 (Figure 1c)

1853. *Megachile fraterna* Smith, *Cat. Hym. Brit. Mus.*, **1**: 178 (H, ♀).

Material examined: 01 ♀, India, West Bengal, Sundarban, Sagar Island, 21.7269°N, 88.1096°E, 20.iii.2018, sweep net, coll. Kashramkar; 01 ♀, Mandirtala, 21.8205°N, 88.0987°E, 26.x.2018, Handpicked, coll. S. Dey.

Distribution: India, Sikkim (Gupta, 1993), West Bengal (new record).

Floral associations: *Crotalaria juncea* (Fabaceae) (Chatthanabun & Warrit, 2019).

IV. Subgenus ***Eutricharaea*** Thomson, 1872

4. *Megachile (Eutricharaea) coelioxysides* Bingham, 1898 (Figure 1d)

1899. *Megachile coelioxysides,* Bingham, *J. Bombay Nat. Hist. Soc.*, 12: 126.

Material examined: 01 ♀, India, Puducherry, Yedulanga, 16.7131°N, 82.2104°E, 03.xi.2019, sweep net, coll. A. Rameshkumar; 01 ♀, India, West Bengal, Mahananda Wildlife Sanctuary, Watch Tower, Anti-poaching camp, 26.6177°N, 89.5605°E, 27.iii.2018, sweep net, coll. A. Rameshkumar.

Distribution: India, Himachal Pradesh, Rajasthan, Haryana (Gupta, 1993), Gujarat (Bingham, 1898), Maharashtra (Waykar and Baviskar, 2016), Puducherry (new record), West Bengal (new record).

Floral associations: *Tagetes sp., Tridax procumbens* (Asteraceae), *Trifolium* sp. (Fabaceae) (Gupta, 1993).

5. *Megachile (Eutricharaea) hera* Bingham, 1897 (Figure 1e, 2f)

1897. *Megachile hera* Bingham, *Fauna of British India,* **1**: 489.

Material examined: 01 ♀, India, West Bengal, Sagar Island, Chemaguri, 21.6625°N, 88.1425°E, 27.vii.2019, Sweep net, coll. A. Rameshkumar; 01 ♀, Mahananda Wildlife Sanctuary, Watch Tower, Anti-poaching camp, 26°37.067′N, 89°33.633′E, 27.iii.2018, Sweep net, coll. A. Rameshkumar; 01 ♀, India, Puducherry, Yedulanga, 16.7131°N, 82.2104°E, 03.xi.2019, Sweep net, coll. A. Rameshkumar; 01 ♂, India, Dadra & Nagar Haveli and Daman & Diu, Damanganga circuit house campus, 20.2640°N, 72.9887°E, 20.i.2018, YPT, coll. A. Rameshkumar.

Distribution: India, Punjab, Rajasthan, Himachal Pradesh, Gujarat (Gupta, 1993), Maharashtra, Jammu & Kashmir (Shankar *et al.*, 2017), Uttar Pradesh, Kerala (GBIF, 2020b), Uttarakhand (Khan *et al.*, 2016), Karnataka (Veereshkumar, 2015), West Bengal, Puducherry (new record), Dadra and Nagar Haveli (New record).

Floral associations: *Medicago sativa* (Fabaceae), *Tagetes* sp., *Coreopsis* sp., (Asteraceae), *Vitex negundo* (Lamiaceae) (Gupta, 1993), *Parkinsonia aculeata* (Fabaceae) (Shankar *et al.*, 2017), *Salvia glutonisa* (Lamiaceae), *Campanula latifolia* (Campanulaceae), *Millettia pinnata, Tephrosia hamiltonii* (Fabaceae) (Kumari *et al.*, 2019), *Coccinia grandis* (Cucurbitaceae) (new record).

6. *Megachile (Eutricharaea) vera* Nurse, 1901 (Figure 2g)

1901. *Megachile vera* Nurse, *J. Asiat. Soc. Bengal,* **70**: 150.

Material examined: 01 ♀, India, Dadra and Nagar Haveli and Daman and Diu, Vasona, 20.2552°N, 73.0031°E, 23.i.2018, YPT, A. Rameshkumar; 01 ♀, India, West Bengal, Kolkata, Char Mandir Ghat, 22.6709°N, 83.3605°E, 27.vii.1992, Sweep net; 01 ♀, India, Dadra and Nagar Haveli (U.T.), Silvassa circuit house campus, 20.26°N, 72.97°E, 20.i.2018, YPT, coll. A. Rameshkumar.

Distribution: Rajasthan, Gujarat, Haryana, Punjab (Gupta, 1993), Maharashtra, Himachal Pradesh, Odisha, Dadra and Nagar Haveli (new record), West Bengal (new record).

Floral associations: *Derris pinnata, Crotalaria juncea, Trifolium* sp. (Fabaceae), *Helianthus annuus, Tagetes* sp., *Coreopsis* sp., *Tridax* sp. (Asteraceae) (Gupta, 1993), *Ocimum sanctum* (Lamiaceae), *Foeniculum vulgare* (Apiaceae) (Kumari *et al.*, 2019).

7. *Megachile (Eutricharaea) gathela* Cameron, 1908 (Figure 2h)

1908. *Megachile gathela* Cameron, *J. Bombay Nat. Hist. Soc.*, **18**: 650 (H, ♀).

Material examined: 01 ♀, India, Gujarat, Dwarka, near railway station, 13.xii.1973, net sweep, coll. S.K. Gupta; 01 ♀, India, Himachal Pradesh, Kaza, 32.2252°N, 78.0523°E, 14.xi.2011, Sweep net, coll. S. Ray.

Distribution: Gujarat (Cameron, 1908), Rajasthan, Himachal Pradesh, Haryana, Punjab (Gupta, 1993), Uttarakhand (Khan *et al.*, 2016).

Floral associations: *Lagerstroemia* sp. (Lythraceae), *Bauhinia latifolia, Crotalaria juncea, Medicago sativa, Derris pinnata, Tephrosia hamiltonii, Parkinsonia* sp., *Acacia* sp. (Fabaceae), *Helianthus annuus, Tagetes* sp., *Gaillardia* sp., *Tridax procumbens* (Asteraceae), *Brassica campestris* (Brassicaceae), *Vitex negundo* (Lamiaceae), *Boerhavia diffusa* (Nyctaginaceae), *Jacaranda mimosifolia, Tecoma stans* (Bignoniaceae), *Grewia asiatica* (Malvaceae), *Adhatoda vasica* (Acanthaceae) (Gupta, 1993).

V. Subgenus ***Pseudomegachile*** Friese, 1898

8. *Megachile (Pseudomegachile) lanata* Fabricius, 1775 (Figure 2i, 2j)

1775. *Apis lanata* Fabricius, *Syst. Entomol.*: 385.

Material examined: 01 ♂, India, West Bengal, Hooghly, Dankuni, 05.i.1978, net sweep, coll. A.K. Roy; 01 ♂, India, Assam, Majuli Island, Garamur Satra, 26.9661°N, 94.0707°E, 14.iii.2019, YPT, coll. A. Rameshkumar; 01 ♀, India, Dadra & Nagar Haveli and Daman & Diu, Silvassa circuit house campus, 20.26°N, 72.97°E, 23.i.2018, YPT, coll. A. Rameshkumar.

Distribution: India, Himachal Pradesh, Haryana, Punjab, Gujarat, Rajasthan (Gupta, 1993), Karnataka, Jammu, Kerala, Maharashtra, Tamil Nadu, Uttar Pradesh, Madhya Pradesh (GBIF, 2020c), Uttarakhand (Khan *et al.*, 2016), West Bengal (new record), Assam (new record), Dadra and Nagar Haveli (new record).

Floral associations: *Cajanus cajan, Crotalaria juncea, Medicago sativa, Parkinsonia* sp., *Bauhinia latifolia, Derris pinnata, Pisum* sp., *Lathyrus odoratum, Doliches lablab* (Fabaceae), *Grewia asiatica* (Malvaceae), *Tridax procumbens, Helianthus annuus* (Asteraceae), *Lagerstroemia indica* (Lythraceae), *Duranta* sp. (Verbenaceae), *Jacomentia* sp. (Nymphaeaceae), *Ipomoea palmatus* (Convolvulaceae), *Campsis radicans, Tecoma stans* (Bignoniaceae), *Murraya paniculata* (Rutaceae), *Vitex negundo* (Lamiaceae), *Nerium* sp. (Apocynaceae), *Adhathoda vasica* (Acanthaceae), *Jacaranda mimosifolia* (Bignoniaceae), *Justicia thyrsifolius* (Acanthaceae), *Boerhavia diffusa* (Nyctaginaceae) (Gupta, 1993).

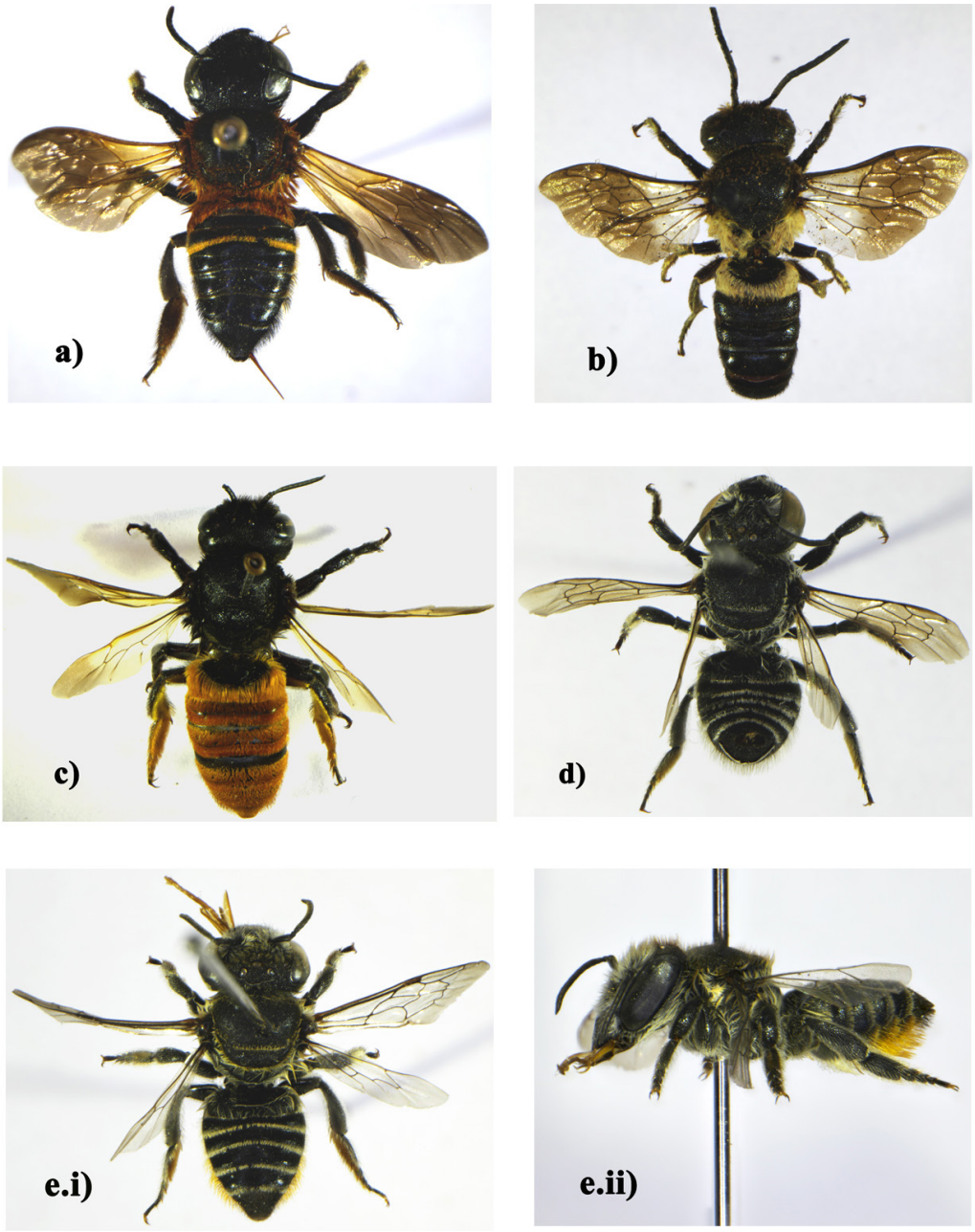

Figure 1. *Megachile* species from India. **(a)** *M. laticeps* ♀ (dorsal view); **(b)** *M. disjuncta* ♂ (dorsal view); **(c)** *M. fraterna* ♀ (dorsal view); **(d)** *M. coelioxysides* ♀ (dorsal view); **(e.i)** *M. hera* ♀ (dorsal view); **(e.ii)** *M. hera* ♀ (lateral view).

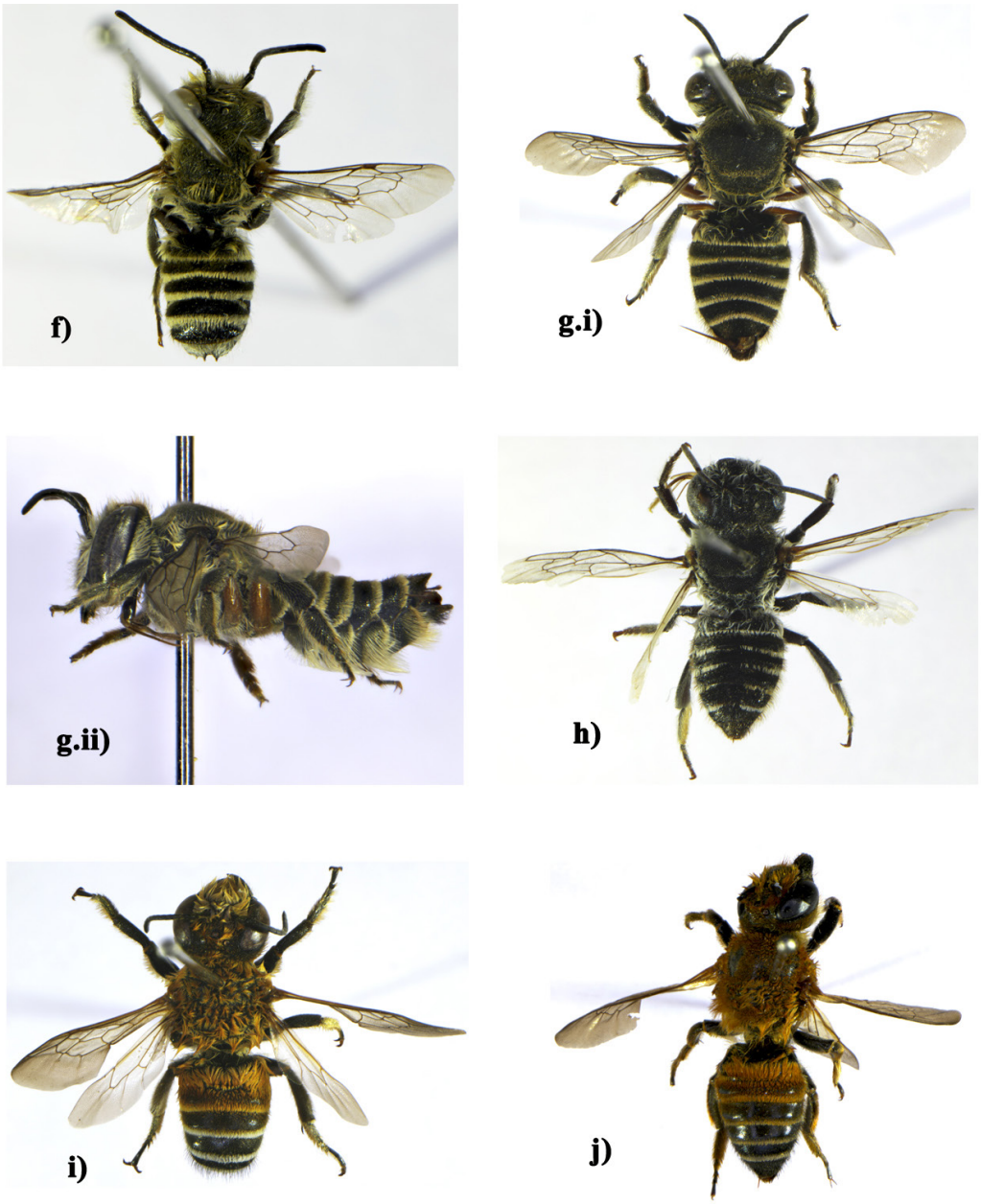

Figure 2. *Megachile* species from India. **(f)** *M. hera* ♂ (dorsal view); **(g.i)** *M. vera* ♀ (dorsal view); **(g.ii)** *M. vera* ♀ (lateral view); **(h)** *M. gathela* ♀ (dorsal view); **(i)** *M. lanata* ♂ (dorsal view); **(j)** *M. lanata* ♀ (dorsal view).

Discusssion

The present study reveals the new distributional records of 7 *Megachile* species in 5 different states and 2 union territories of India. *Megachile lanata* Fabricius, 1775 is reported for the first time from North Eastern India (Assam) which comprises a major part of the Indo-Burma biodiversity hotspot. Species of *Megachile* are efficient pollinator of Fabaceae and Lamiaceae and hence can be commercially utilized in agricultural fields as an effective alternative to *Apis* bees to pollinate plants belonging to these families.

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